

Multi-Carrier Cellular Coverage Enhancement



The Centre Hospitalier de l'Université de Montréal (CHUM) is one of the largest healthcare facilities in Canada with over 3.5 million square feet distributed over multiple buildings in downtown Montréal, Quebec.

Under contract to the Public Private Partnership (P3) run by the Collectif Santé Montréal consortium, and working with GBIT Logistics, Cartel Communication Systems provided the engineering, design, and commissioning of a radio enhancement Distributed Antenna System (DAS) for the CHUM. The DAS had to distribute the signals of the 4G cellular frequency coverage, 900 MHz paging system, and UHF operational radio system.

We believe that life is better when we communicate. Read more to find out how that proved true at the Centre Hospitalier de l'Université de Montréal.

Discovery & Collaboration

A P3 partnership often begins with a consortium of companies that work together to determine how to best complete a project. That was the case with the CHUM. When it came to its communication requirements, CHUM wanted a neutral host vendor, one who could work with but was not one of Canada's cellular providers. Cartel was contacted by GBIT Logistics to help them with their part in the massive project that would become the CHUM.

Cartel's design of the DAS echoed CHUM's architectural design. Because industry stakeholders in P3 consortiums help design as well as build (and sometimes maintain and operate) projects, Cartel began engineering the cellular coverage and DAS from CHUM's earliest conceptual sketches.

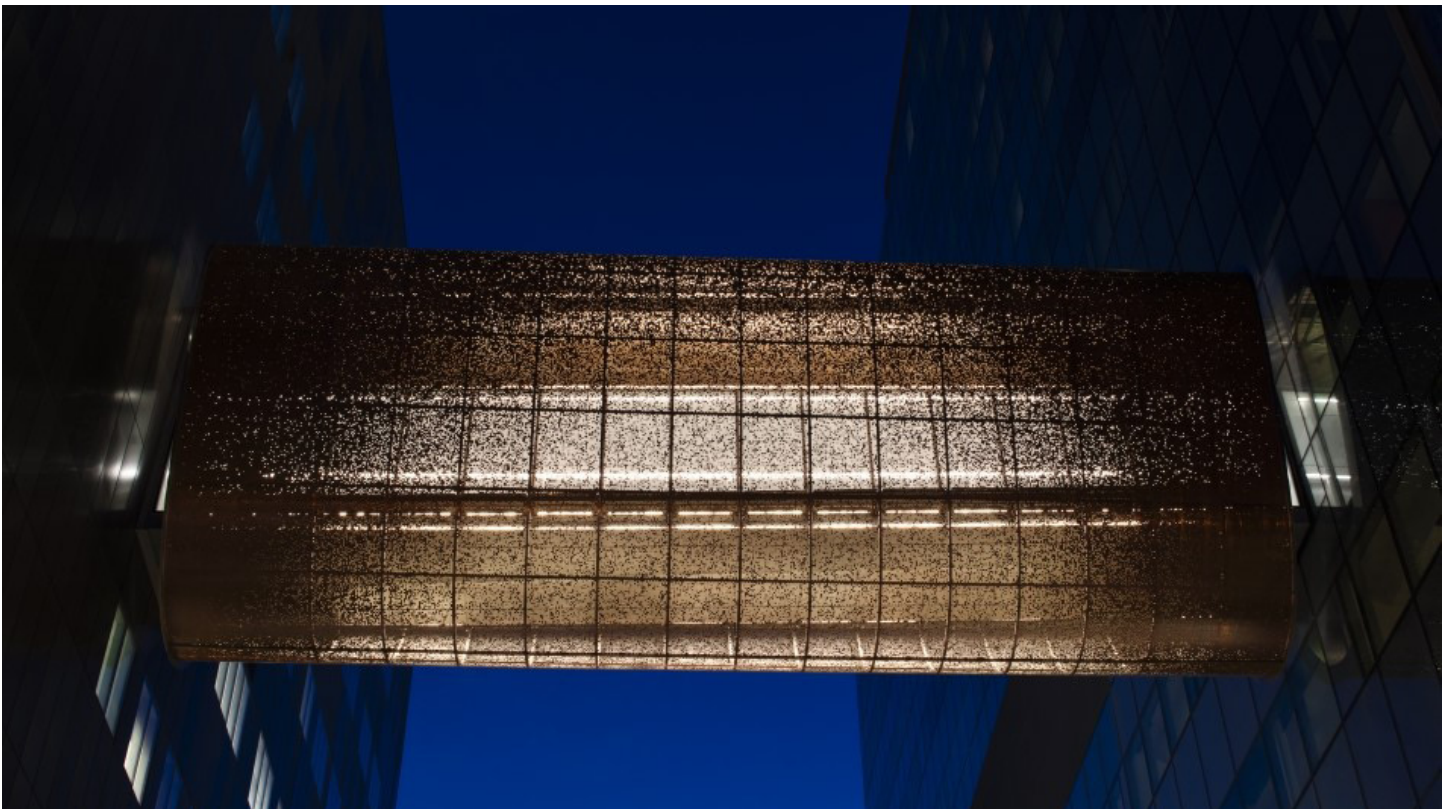
Cartel continued to engineer coverage solutions for the bridge, the tunnels, and underground garages, as they were added to the designs.

About CHUM

The new, bright, patient-centred campus combines state of the art technology, including robotic carts that deliver food, laundry, and medicine to patients, and "found" elements such as the grey-stone façades of the 1890 Garth House and the bell tower of the 1865 Holy Trinity church.

Covering an entire city block in downtown Montreal, the CHUM hospital complex consists of 772 patient rooms, 39 operating rooms, 415 examination rooms, an emergency centre, the Outpatient Clinic Pavilion, and the Integrated Cancer Center. The hospital is 21-storeys tall; the outpatient clinic is 19-storeys. Both buildings have four levels below grade. The 9-storey specialized and logistics building sits behind both. The pavilions are connected by two tunnels and a sky bridge.

Over 12,850 people work at CHUM; the campus treats half-million patients annually. Cartel's DAS had to be capable of supporting all users across the healthcare centre, from the elevators to the operating rooms.





In-Building Coverage and Capacity

Cartel's design for the CHUM needed to cover three kinds of signals: multi-bands 850 MHz, 1900 MHz (PCS) and 2100 MHz (AWS) cellular coverage for patients and staff, two in-hospital paging systems for doctors and nurses (900 MHz bands), and a radio signal for security personnel (450 MHz UHF radio).

The signals from the Canadian wireless carriers – Telus, Rogers, and Vidéotron – are routed through a Point of Interface (POI) located at the DAS headend. These are combined by band specific POI's that allowed for attenuation, filtering to provide an acceptable signal level to the base interface unit (BIU), and then fed to the fibre interface unit (FIU) and distributed throughout the facility to the fibre-fed remote amplifiers (FBDA).

The cellular DAS system is comprised of active components that utilized a fibre optic backbone which allows cellular signals to be carried over this backhaul. Because it would need to handle extremely heavy usage from multiple carriers in a variety of environments (including the copper clad footbridge) the DAS was designed to manage heavy capacity load and bandwidth.

Cartel's design included 40 fibre Bi-Directional Amplifiers (FBDA) and 836 antennas installed at various locations across the campus. The FBDA's consist of a fibre Combining Module and 3 RF Amplifiers, one for each cellular band. The DAS system for CHUM runs over an impressive 22,000+ meters of coaxial cable. This type of distributed antenna system allows for maximum coverage for the end users and the ability to carry signals for multiple users at the same time.

Located on the roof of the hospital pavilion, the 900 MHz critical "code-blue" paging system is passively distributed throughout the campus utilizing no amplifiers. The distribution of the 900 MHz paging system was accomplished by combining the two (2) signals from 2 RF transmitters and combining these signals to the cellular signals at each FBDA. It operates separately from, but in parallel with, the cellular system, using the same antennas.

The distribution of 450 MHz UHF radio system for security personnel was accomplished by injecting directly from the transmitter into a separate passive DAS distributed through all the buildings and routed through 46 UHF antennas.

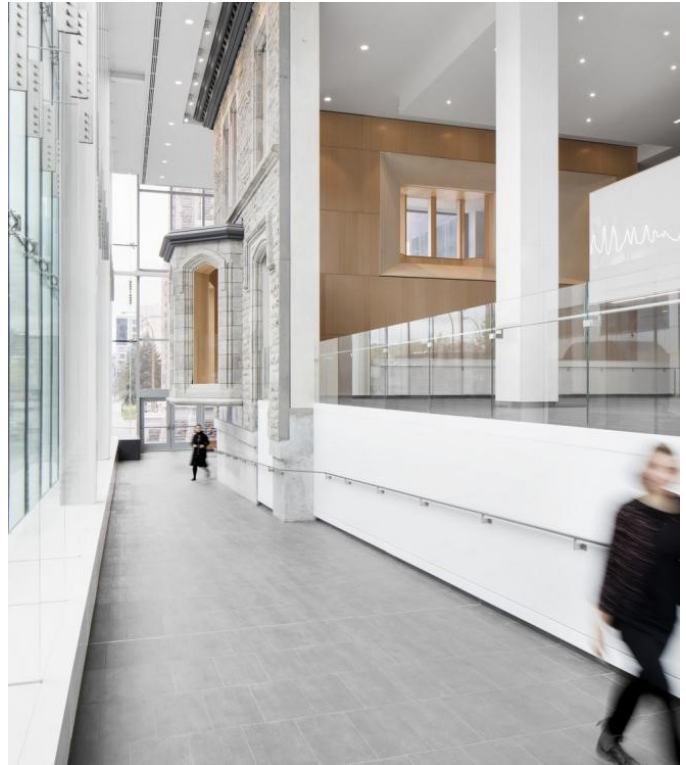
Deployment in CHUM

The health and safety of patients are paramount in any health care environment. In planning for CHUM, Cartel designed the system with maintenance in mind and routed cables in public spaces instead of in the patient rooms, when we could. Hospitals, especially operating rooms, even if they are empty, need to maintain surgical levels of cleanliness. Detailed planning and schedule-keeping is part of keeping the hospital safe.

Keeping dust and germs out of spaces at CHUM was not our only concern. In spaces like XRAY rooms, lead barriers line the walls, in order to keep the radiation from escaping the rooms. This also means that Radio Signals cannot get into the same space.

Here, engineering, design, installation all must work in harmony. In order to get RF into these kinds of spaces, deployment brings an antenna right into the XRAY room, find the pathway where the electrical goes through, or look to core through the lead lining and backfill the core firestop.

Final Commissioning ensured the system at CHUM was calibrated, a process that necessarily happened once the hospital was fully operational and the three kinds of signals (multi-band cellular coverage, the in-hospital paging systems, and the radio signal for security personnel) were being used normatively. This meant employing the care, discretion, and courtesy Cartel is known for as what was once an empty construction site became a bustling hospital.



The Cartel Way

There from early single floor sketches to final fine-tuning of the subfloor antenna, Cartel was able to provide agile engineering and respond to dynamic construction changes. With a final commissioning and a close-out package, Cartel made sure CHUM had a comprehensive record of what technologies they have, where they are, and how they are functioning in the three buildings they support. Cartel did full life cycle management contract for the 1st year and we continue to support the CHUM on a month to month basis.

If your project requires a multi-carrier cellular coverage, enhancement, or a Distributed Antenna System, please give us a call. Cartel will find a solution to fit your requirements.

